LAB 26-NOV-2020

SPANNING-TREE PROTOCOL

Step 1 (1a) :- Verify the Spanning tree protocol

Switch A# sh Spanning-tree

Step(1b):- Verify the detail

SwitchA#sh spanning-tree Vlan 1 detail

Step 2(a)
Switch B# Sh spanning-tree

Step (2b)
Switch B# Sh Spanning-tree Vlan 1 detail

Step 3 :- Changing non root switch to root switch.

Switch B# config t
Switch B (config) # Spanning-tree Vlan 1 priority 4096

Step 4 (a) :- Verify the Spanning-tree protocol on switch B after changing priority.

Switch B# Sh Spanning-tree Vlan 1

Switch 2950-24 Ethernet.

Step(4b):- Verify the spanning-tree protocol on switch 'a' after changing priority.

Switch A # Shc Spanning-tree Vlan1

Step 5 changing Cost

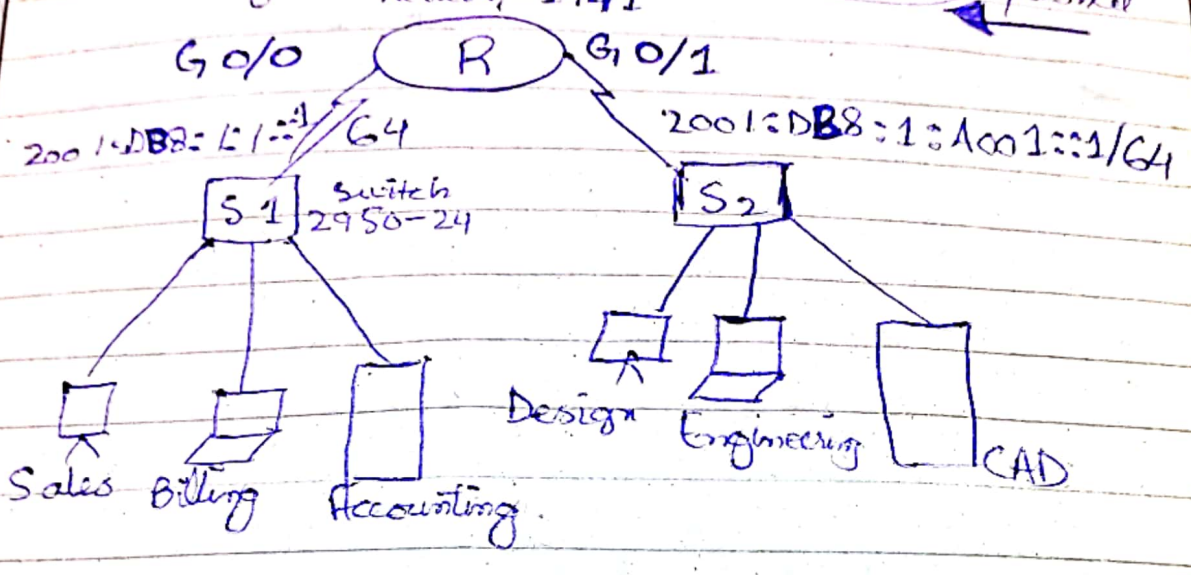
SwitchA(Config)# int fa 0/24

Switch A(Config-if)# Spanning-tree Vlan1 Cost 18

(94)

27-Nov-2020 LAB

LAB: IPv6 Address at Router's interface



~~Sales: 2001:DB8:1:A00~~ Default Gateway

FE80::1

Sales: 2001:DB8:1:1::2/64

Billing: 2001:DB8:1:1::3/64

Accounting: 2001:DB8:1:1::4/64

Design: 2001:DB8:1:2::2/64

Engineering: 2001:DB8:1:2::3/64

CAD: 2001:DB8:1:2::4/64

Default Gateway

LAB

IpV6 = 128 bit

16 octet

Hex
A = 10
B = 11
C = 12
D = 13
E = 14
F = 15

for eg:- 2 = 0010
0 = 0000
0 = 0000
1 = 0001

:: represents 0000
: represents 00

H → D → B
B → D → H

R1 G 0/0
G 0/1
S 0/0/0

Link-Local FE80::1

↘

It's a virtual Link not physical. Which is used for (Back up).

LAB

R1(config)# ipv6 unicast-routing

R1(config) int g0/0

if # ipv6 address 2001:DB8:1:1::1/64

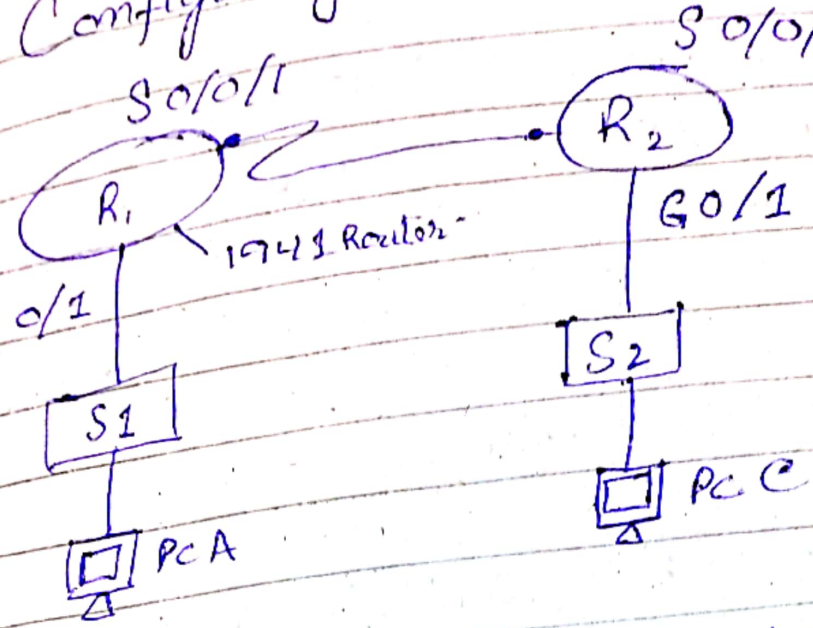
if # ipv6 address FE80::1 link-local

no shutdown.

Link-Local will always remain same.

29-Nov-2020 LAB

Configuring IPv6 Static Route :-



R1	G0/1	2001 : DB8 : ACAD : A :: /64 eui-64
	S0/0/1	FC00 :: 1 /64
R2	G0/1	2001 : DB8 : ACAD : B :: /64 eui-64
	S0/0/0	FC00 :: 2/64

A SLAAC

C SLAAC

R1(config)# ipv6 unicast-routing

R1(Config)# interface g 0/1

ipv6 address 2001 :DB8:
ACAD :A::/64 eui-64

no shutdown

R1(Config) # interface S 0/0/1

ipv6 address FC00 :: 1/64

no shutdown

#exit

R1(Config)# ipv6 unicast-routing
#interface g 0/0
#ipv6 address 2001:DB8:ACAD:B::/64 eui-64
#no shutdown
#exit

R2(Config)# int s 0/0/0
#ipv6 address FC00::2/64
#no shutdown.

NOTE: Take 1941 Routers then add Module HWIC-2T in both to Connect each other by Serial ports. Because, 1941 has no serial ports.

A: 2001:DB8:ACAD:A:230:A3EF:FE3D:ABC4/64

Gateway:-
FE80:: 260:3EFF:

(104) . Cm> ipv6 config/all

PC0

IPV6 Address:
2001:DB8:ACAD:A:202:4AFF:
FEA0:B334 /64

Gateway:
FE80::202:16FF:FE13:7602

13

PC1

2001:DB8:ACAD:B:260:70FF:
FE40:D42C /64

Gateway:
FE80::206:2AFF:FE6E:3C02

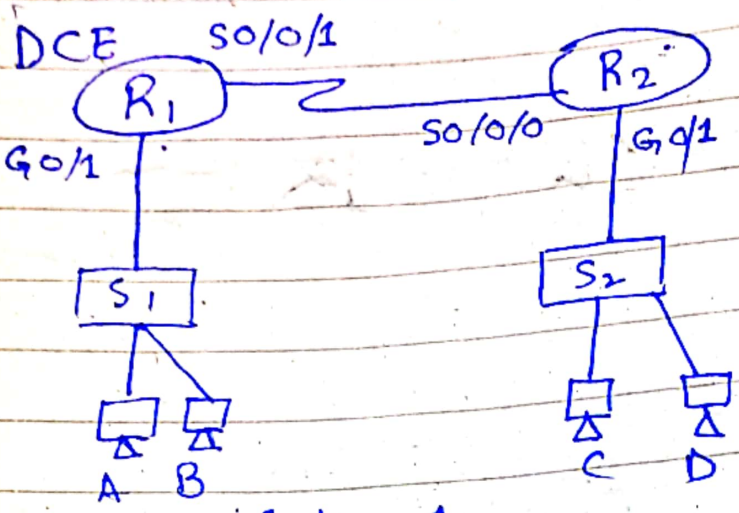
LAB

3/Dec/2020

22-Nov-2020

THEORY.

PROJECT LAB IPv6 Static Route



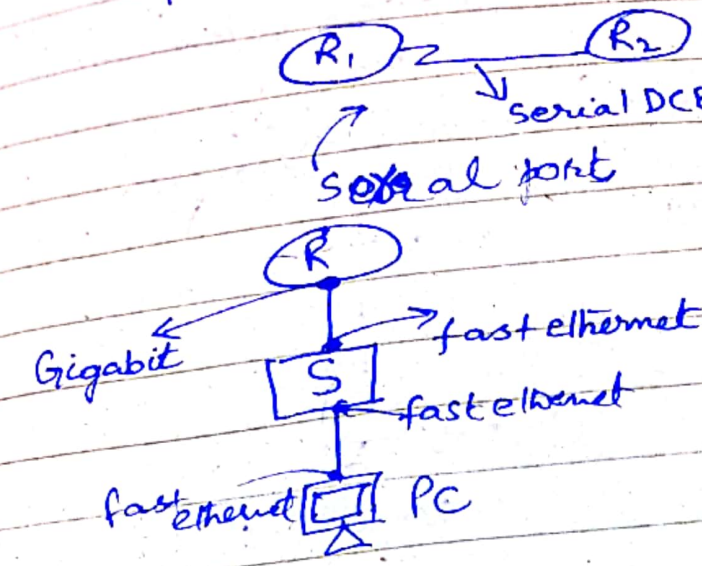
		↓Gateway 1	
R_1	G0/1	2001:ABCD:ABCD:0001::1/64	eui-64
	S0/0/1	2001:ABCD:ABCD:0002::1/64	
		↓Gateway 2	
R_2	G0/1	2001:ABCD:ABCD:0003::1/64	eui-64
	S0/0/0	2001:ABCD:ABCD:0002::2/64	

PCA	-	2001:ABCD:ABCD:0001::2/64	Gateway 1
PCB	-	2001:ABCD:ABCD:0001::3/64	

C	-	2001:ABCD:ABCD:0003::2/64	Gateway 2
D	-	2001:ABCD:ABCD:0003::3/64	

R1(Config)# interface G0/1
R1(Config)# ipv6 unicast-routing
#ipv6 address 2001:ABCD:
ABCD:0001::1/64 eui-64
no shutdown

R1(Config)# interface S0/0/1
ip address 2001:ABCD:ABCD:0002::1/64



Then ping the PC A to PC B in Cmb pmpt.
It will give result as connectivity.

Then ping the PC C to PC D in Cmd pmpt.
It will give Request timed out.

Then run in Command pmpt. in All PCs
IPv6Config <Space> /all.

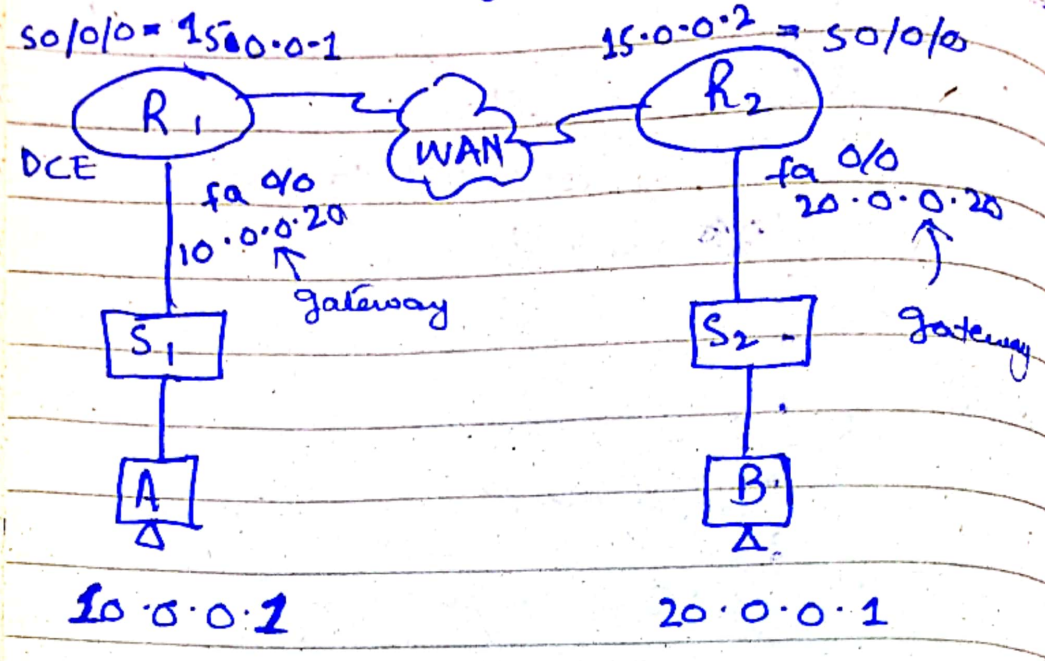
R1(config)# ipv6 route 2001:ABCD:ABCD:0003::1/64 2001:ABCD:ABCD:0002::2
Destination Gateway — Last Gateway

Do the same for R2
R2(Config)# ipv6 route 2001:ABCD:ABCD:0001::1/64

4/Dec/2020 LAB

DYNAMIC ROUTING PROTOCOL

RIP (Routing Information Protocol)



R1 # Show ip route
R2 # Show ip route

R1(config) # router rip
network 10.0.0.0
network 15.0.0.0

R2(config) # router rip
network 20.0.0.0
network 15.0.0.0

R1 # Show ip protocols

4/12/2020 LAB

Directly Connected Network to R_1 :-

10.0.0.0

15.0.0.0

Indirectly Connected Network to R_1 :-

20.0.0.0

** Because ↑ it's Connected via another Router

Directly Connected N/w to R_2 :-

20.0.0.0

15.0.0.0

Indirectly Connected N/w to R_2 :-

10.0.0.0

C = Connected Directly

C = " "

R = Rip ∴ Through Connected N

Bec2 of Rip Protocol

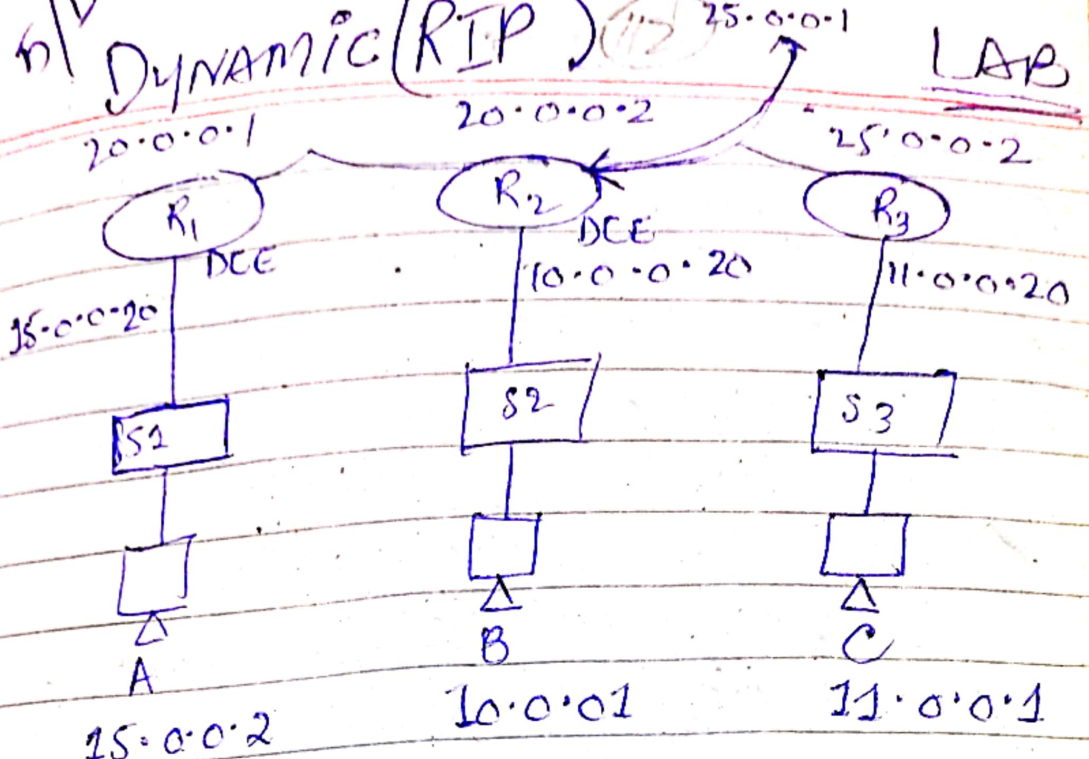
{ Rip works on minimum hop Count }

120 = AD

RIP

6/Dec/ ... with Multiple Networks

Dynamic (RIP) LAB

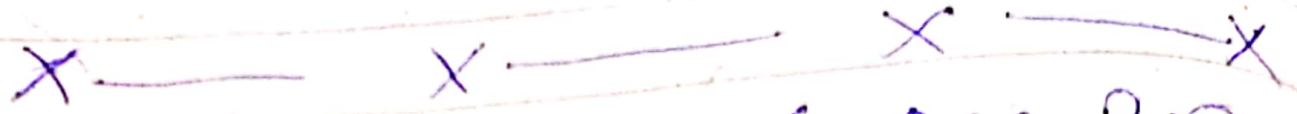


R1 # Show ip route
R2 # Show ip route 120/1 ← HOP
AD

R1(config)# router rip 120/2 HOP
AD
network 15.0.0.0
network 20.0.0.0

R2(config)# router rip
network 20.0.0.0
network 25.0.0.0
network 10.0.0.0

R3(config)# router rip
network 11.0.0.0
network 25.0.0.0



6-Dec-2020

LAB

OSPF (Open shortest path First)

R1# Show ip route
R2# Show ip route

Process ID

R1(config)# router ospf 1
network 10.0.0.0 0.255.255.255 area 0
~~# network~~
network 11.0.0.0 0.255.255.255 area 0
exit
R1(config)# interface loopback 1
ip address 1.1.1.1 255.255.255.255

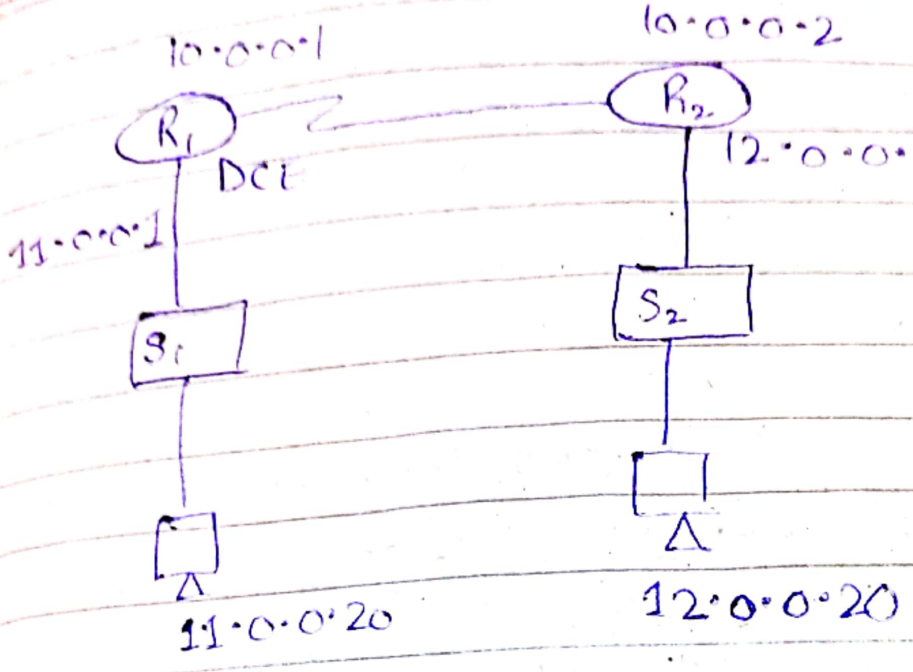
broadcast address

(b) Unit 2

6 Dec 2020

Backbone area

Area 0



OSPF

works on minimum Cost.

* Router ospf ? ← Run this Command.

* Process ID of OSPF can be different on each Router.

* Wild card Mask.
  It is the opposite of Subnet mask.

* If the Subnet is 255.0.0.0
  The wild card mask will be 0.255.255.255

R2(config)# router OSPF 1
network 10.0.0.0 0.255.255.255
area 0
network 12.0.0.0 0.255.255.255
area 0
exit

R2(config)# interface loopback 1
ip address 2.2.2.2 255.255.255.255

Broadcast add,

R1 # Show ip protocol
R1 # Show ip ospf neighbor
R1 # Show ip ospf database

R2 # Show ip protocol
R2 # Sh ip ospf neighbor
R2 # Sh ip ospf database,

11-Dec-2020

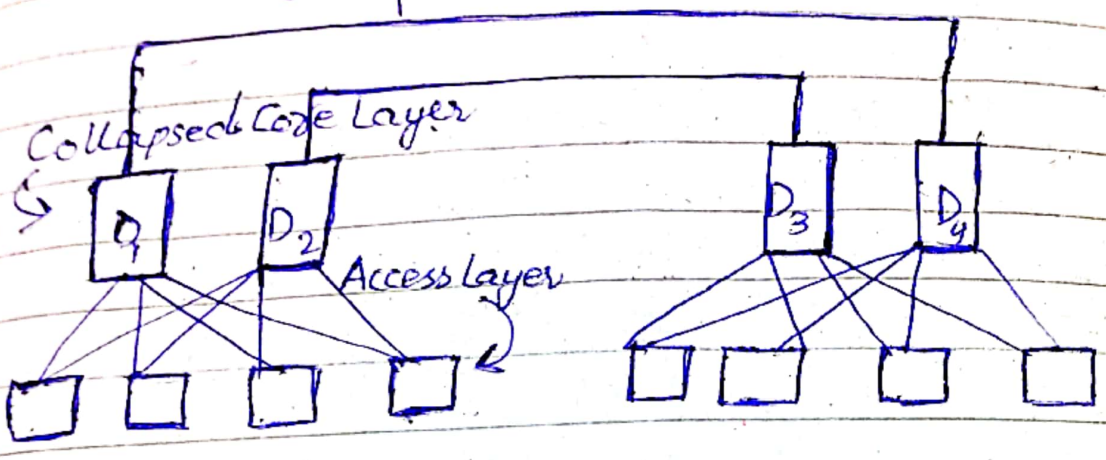
LAB (Designing the Network)

NETWORK ARCHITECTURE

Collapsed Core Architecture

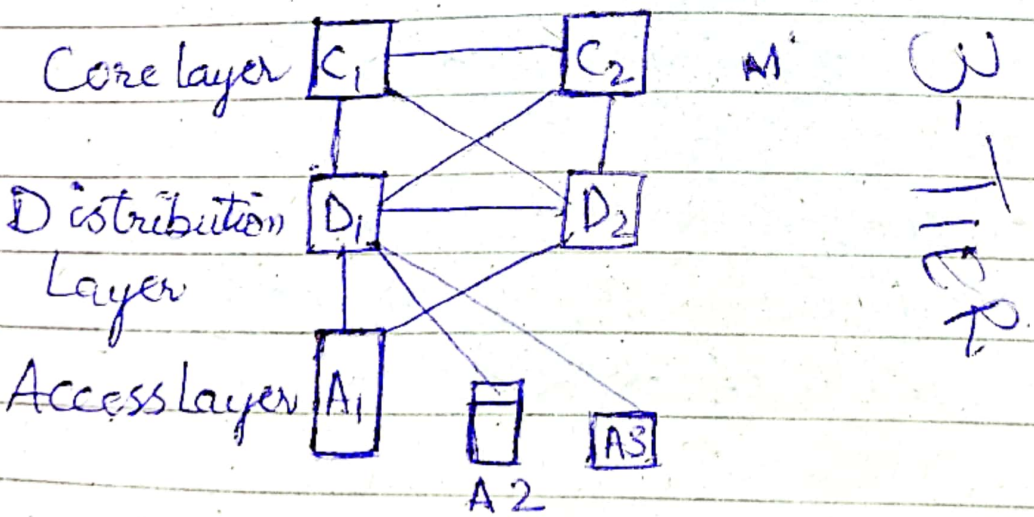
3-Tier Architecture (Fast & Most preffered)

Collapsed Core



(1) Core & Distribution Layers are combined.

(2) Collapsed layer cable of High speed N/w, N/w connecting & Distribution functions - Routing, Filtering, NAT etc



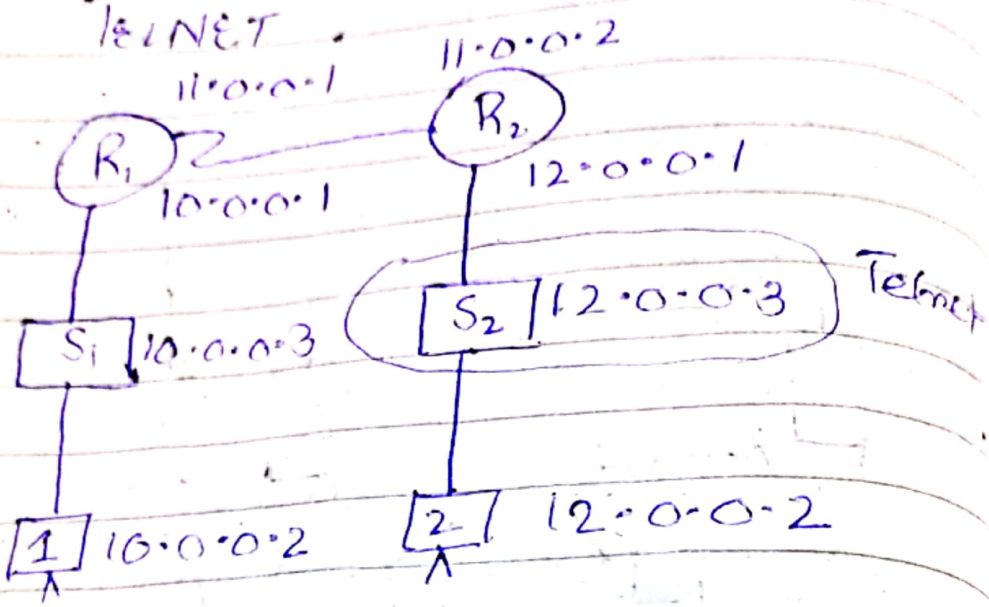
(1) Move Large amount of traffic

(2) Routing, Filtering, WAN Access, NAT, Firewall, Dedistribution (3) Device ... etc.

12-Dec-2020

LAB (Different N/w)

TELNET



S1(config)# int vlan 1
ip add 10.0.0.3 255.0.0.0
no shutdown

S2(config)# int vlan 1
ip add 12.0.0.3 255.0.0
no shutdown

R1(config)# router rip
network 10.0.0.0
network 11.0.0.0

R2 # router rip
R2 # network 11.0.0.0
R2 # network 12.0.0.0

S_2(Config)# default-gateway 12.0.0.1

S_1(Config)# line vty 0 4
Password Cisco 1
Login

S_2(Config)# line vty 0 4
password Cisco 2
Login

CMD Telnet 12.0.0.3

12-Dec-2020

LAB

Introduction of Router with Interface ports :-

Router :- Forwards data packets b/w Computer Networks. Perform "traffic directing" functions on Internet.

Its a Layer 3 (Network Layer) Device. Every router Contains the "Routing table" which holds the Complete information of ~~Source~~ Destination Networks, Default gateway, path, metric value, Subnet mask, Router use different protocols like RIP, OSP, IGRP, EIGRP, BGP & IS-IS protocols for Routing Purpose.

TYPES OF ROUTERS

Broadband Routers:
Communicate on Internet, VOIP, ADSL modem.

Wireless Router:
Now like wifi connectivity.

Edge Router:
Edge of the isp networks.

Subscriber edge Router:
Belongs to end user enterprise organisation.

(These are all Highly Manageable Routers)

(15)

MPLS = Egress Router, Ingress Router,

Routing Table

"RT" update every 30 sec-s. It Changes every time.

Every Router exchange/share its routing table with Every neighboring router's "RT".

RIP, OSPF, IGRP, EIGRP, BGP & IS-IS are protocols used by routers to maintain the "RT" and to achieve the Tasks of Routing.

RIP = Routing information protocol
OSPF = Open shortes path first
IGRP = Interior gateway Routing Protocol
IGRP = Enhanced IGRP

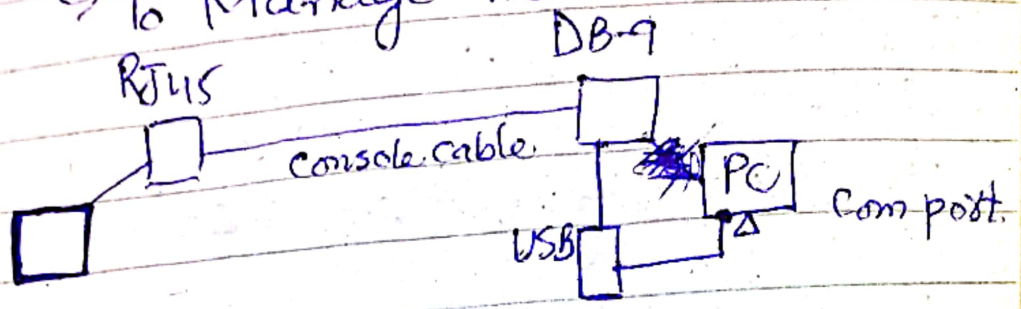
Assignment to Learn
Generation of Mobiles.

Interface Ports

Console Cable
or (Roll over Cable)

RJ45 Connector — DB-9 Connector

↳ To Manage the device.



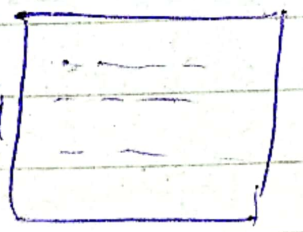
Emulator programs install in PC

① Hyperterminal
OR ② Teraterm
OR ③ Putty

Select Com port from Emulator Software & then give baud rate.

Now you can start configuring the Router via Console Cable.

↳ CLI opend



13-Dec-2020 LAB

ARP (Address Resolution Protocol)

It has two levels.

IP-MAC Mapping done through ARP packets.

[A table associates all IP addresses on network to their MAC addresses.

2 TYPES:

=> Static Mapping

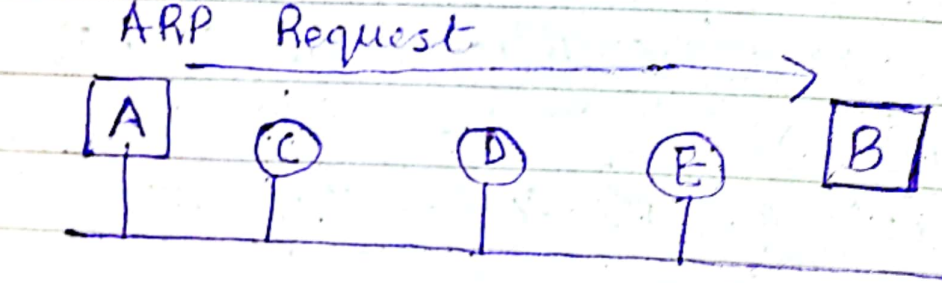
=> Dynamic Mapping

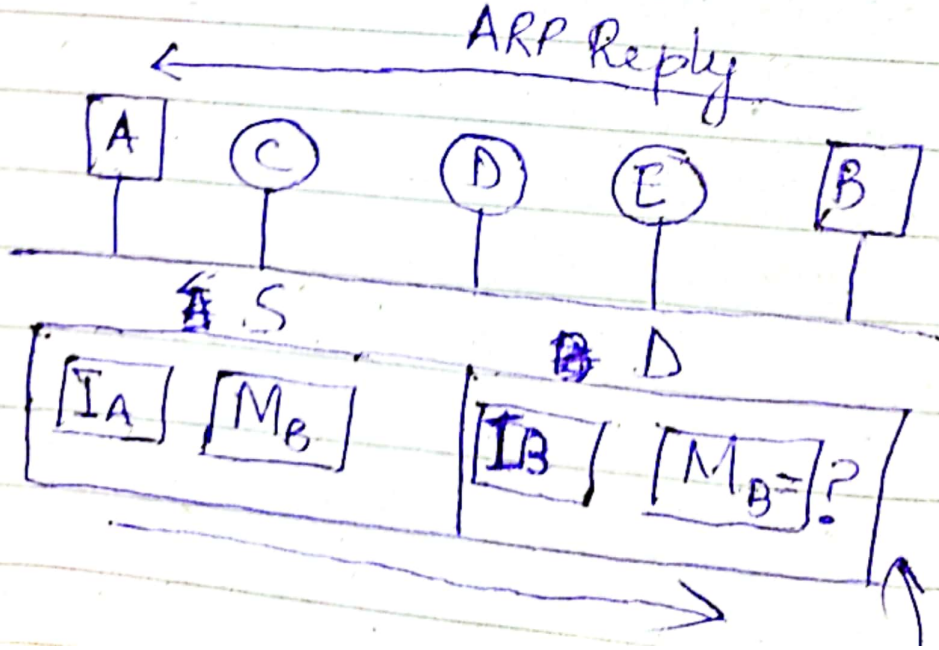
ARP => IP → MAC

RARP => MAC → IP

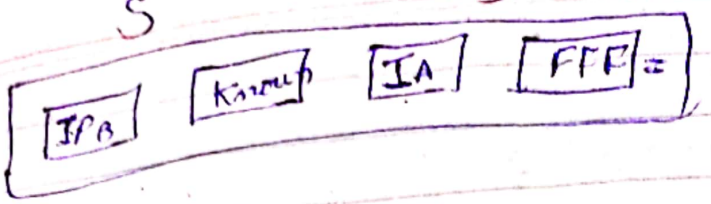
IP : 141.23.56.23

BA : FF : FF : FF : FF





S D

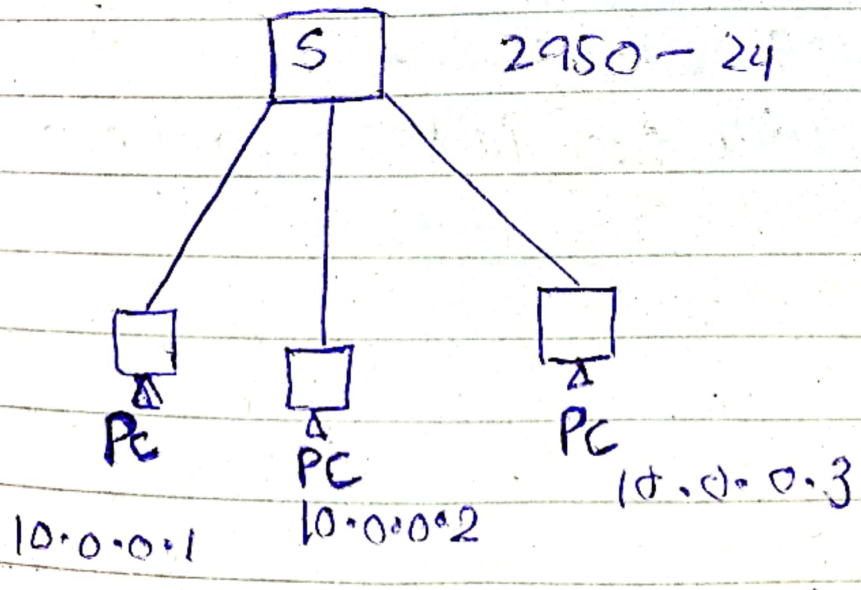


ICMP PPP HDLC
Ethernet Frame Relay
← Layer 2 protocols →

(ARP) :- Destination MAC address will be stored in ARP's cache memory of System -

* ARP Reply is a unicast msg.
* This task is being performed within the network (B/W Switch & PC's)

(*) Jab hum 2 PC's k b/w ping krtay hain - Us k peechay ARP ka process initially performed hota hy.



13 DEC-2020 LAB

① PC_1

C:> arp -a

Ping to PC_2 & PC_3 & Then run cmd.
C:> arp -a on all PCs

Switch
Switch# Sh mac-address-table.

Then goto Simulation Mode. Click on "Auto Capture" button.

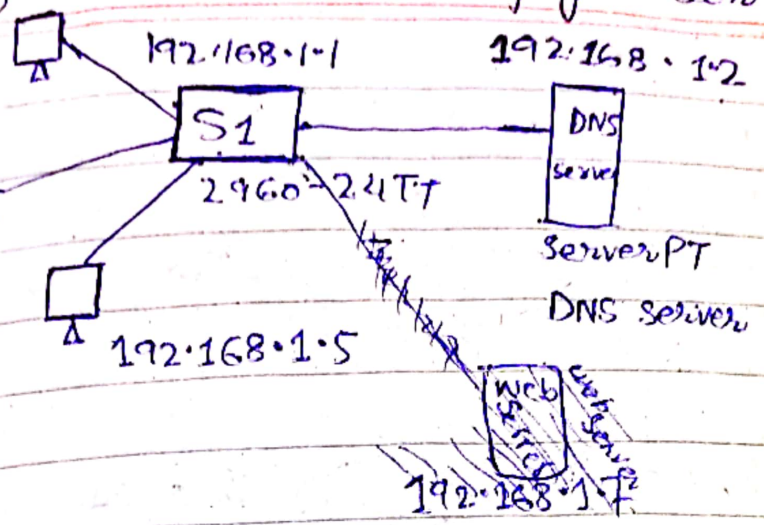
C:> arp -d
to delete ARP Cache

Preamble bits = Starting bits around 4 bits data
Drop packet from PC_1 to PC_2.
Goto Simulation → Auto play
You will see ARP packets.

17 Dec 2020

LAB

DNS Server Configuration



* Resolves host name into IP address
* Before any host can use a DNS services we must configure a DNS server.

PC0
IP : 192.168.1.3
SB : 255.255.255.0
DGateway : 192.168.1.1
DNS Server : 192.168.1.2

PC1
IP : 192.168.1.4
SB : 255.255.255.0
DGateway : 192.168.1.1
DNS : 192.168.1.2

PC2
IP : 192.168.1.5
SB : 255.255.255.0
DGateway : 192.168.1.1
DNS : 192.168.1.2

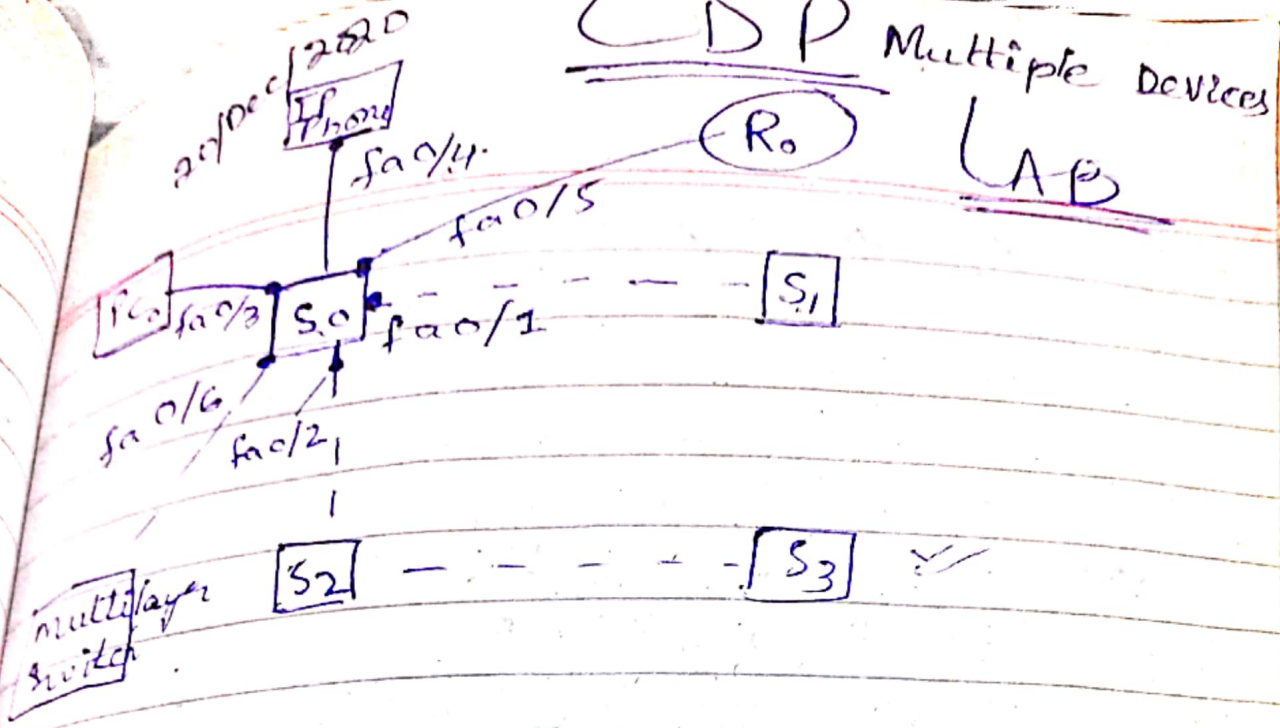
slides min 15 mins
7 mins.

Server

IP: 192.168.1.2
SB: 255.255.255.0
D.Gateway: 192.168.1.1
DNS: 192.168.1.2

S1(Config)# int vlan 1
ip address 192.168.1.1
255.255.255.0
no shut down

CDP Multiple Devices LAB



S0 (config)# cdp run
S0 (config)# cdp timer 50
cdp holdtime 100

S0 # show cdp
S0 # show cdp neighbors
S0 # show cdp interface
S0 # show cdp entry *
S0 # show cdp details.

LAB Network Cabling

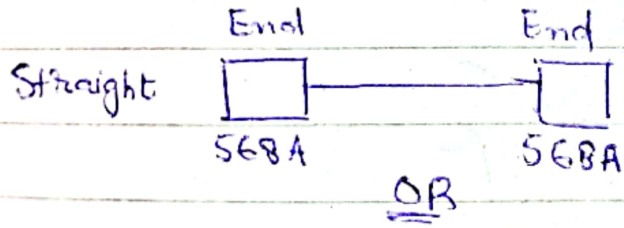
* Straight Cable. (Identical Ends)
* Cross Cable (Different - Ends)

568A	568B
White Green	1- White Orange
Green	2- Orange
White - Orange	3- White Green
Blue	4- Blue
White Blue	5- White Blue
Orange	6- Green
White ~~Orange~~ Brown	7- White Brown
Brown	8- Brown

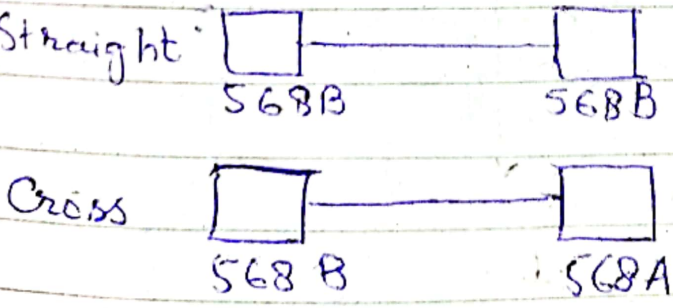
Implementation

Straight Through – for different devices

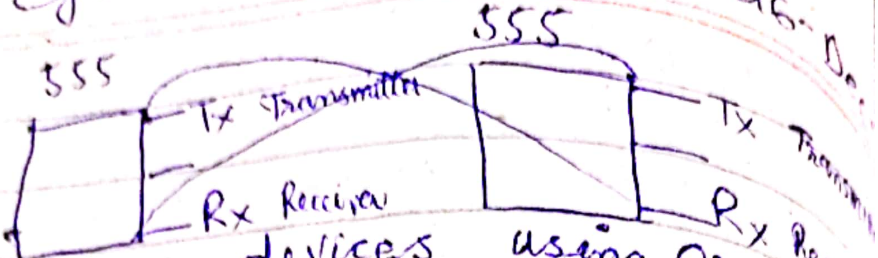
Cross Cable – for Same devices.



OR



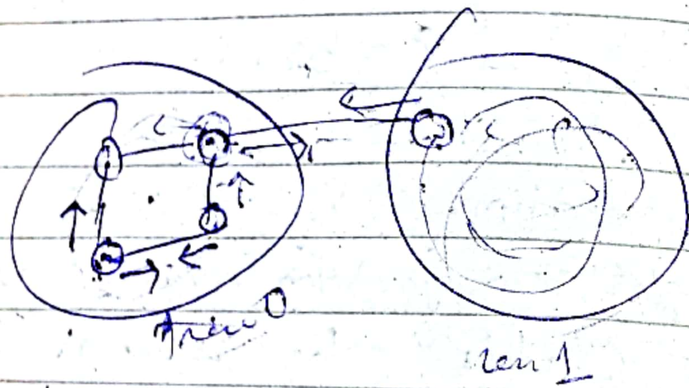
eg :— 25- De



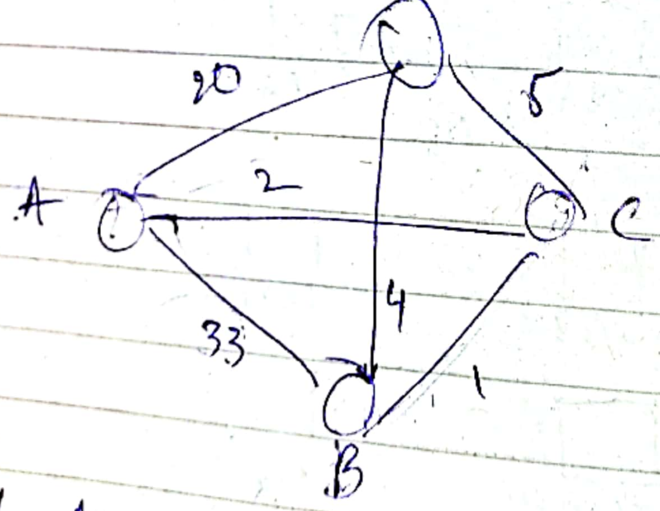
Same devices using CROSS Cable.

Crimping Tool
Has a Cutter for Rj 45 Connector.

Stripping Tool.



4×3 = 12.



d, A → C → B

26-Dec-20

VLANs (Continue)

26-Dec-2020

* Tagging Ethernet Frames for VLAN identification

Frame Layer 2 ka Datagram hy -

* IEEE 802.1Q is a tagging protocol -

* VE 802.1Q ka Tag switch me lgta hy or phir Trunk link per jata hy or travel kr ki destination tak pohanch jata hy -

* Native Vlan me Frame me 802.1Q ki tagging ki zaroort nai hoti -

* Voice VLAN Jahan per (VOIP) use honge unhe VLAN 150 me hi rkhenge -

* Introdution to DTP
(Dynamic Trunk Protocol)

* Server passive mode me hota hy -
User active mode me hota hy -
(i.e) Service providers

Tx Transmitter
Rx Receiver
OSS Cable.
or.

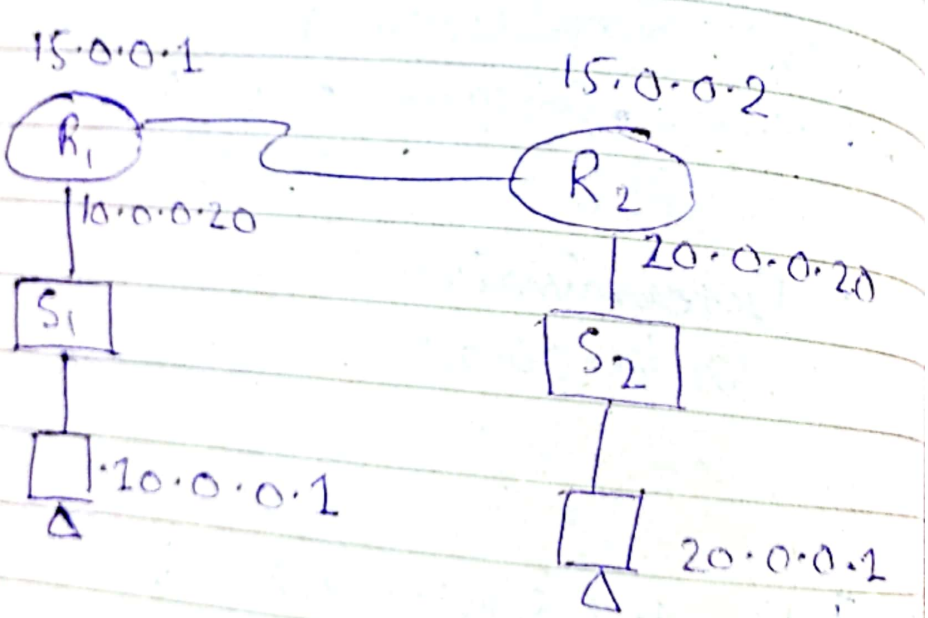
1-Jan-2021

LAB

IGRP (Interior Gateway Routing protocol)

Routing

Static (Manually adds Path)	Dynamic (Automatically Assigned via Routing protocol)
Small Network	Large Network
Topology Knowledge	Less Knowledge of Topology
Don't Discover New path	Discovers New paths
No Over Head (Burden)	Lots of over head



IGRP

Bandwidth + delay

Formula
256 * (Bandwidth + delay)

Routing Protocols
- Interior Routing Protocol (IRP)
- Exterior Routing Protocol (ERP)

Interior Routing Protocol
- IGRP
- EGRP

R1 # show ip route
R2 # show ip route

R1 (config) # router igrp 10 ← Process ID
network 10.0.0.0
network 15.0.0.0

R2 (config) # router eigrp 10
network 20.0.0.0
network 15.0.0.0

Now
R1 # show ip route
R2 # show ip route

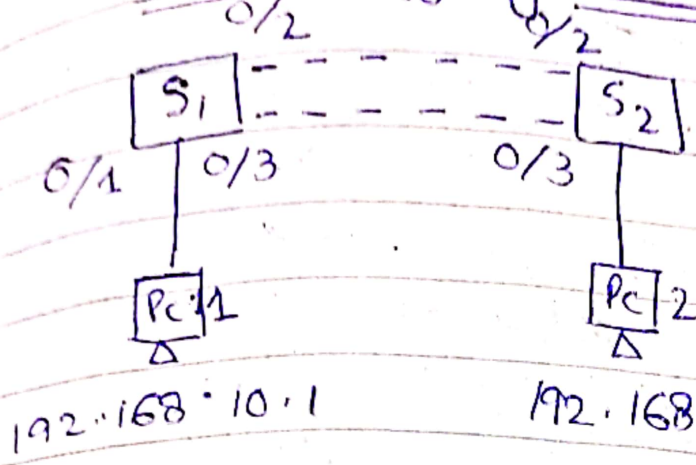
R1 # show ip protocols
R2 # show ip protocols

Distance? Max-hop Count = ?

LAB

2-Jan-202

ETHER CHANNEL - PAgP
(Port Aggregation Protocol)



1. PC2 # Ping 192.168.10.1
2. S1 (config) # Shutdown
3. PC2 # Ping 192.168.10.1
4. S1 (config) # int port-channel 1
   # Switchport mode trunk
   # exit
5. S1 (config) # int range fa 0/2-3
   # Switchport mode trunk
   # channel-group 1 mode auto
6. S2 (Config) # int port-channel 1
   # Switchport mode trunk
   # exit

PAgP (It means Combine into 1 (one) Logical channel)

(7) S2(config)#int range fa 0/2-3
#switchport mode trunk
#channel-group 1 mode desirable

(8) S1 # show spanning-tree

(9) S1 # show ether channel summary

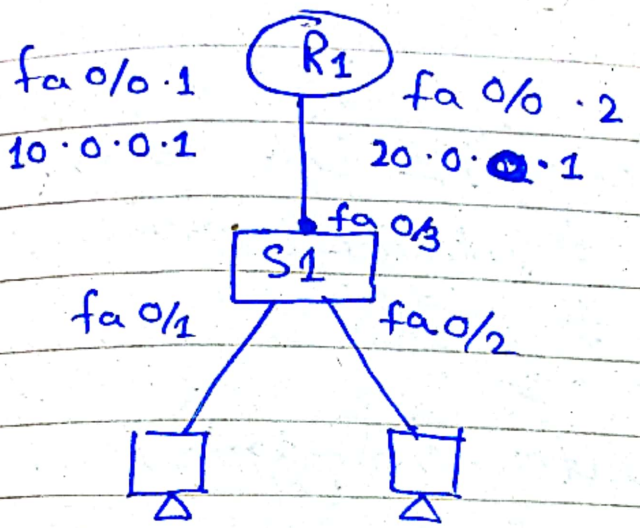
LAB

9-Jan-2021

Router On Stick (ROAS)
InterVLan Communication (IVL)
↳ Creates Logical Interface on Router

2 Common protocols.
↳ ISL
↳ 802.1q
} Encapsulation Protocol.

LAB SCENARIO



VLAN 10
10.0.0.2

VLAN 20
20.0.0.2

Gateway:
10.0.0.1
20.0.0.1

Switch Configuration

(1) S1 (config) # Vlan 10
name marketing
exit

(2) S (config) # int fa 0/1
switchport access Vlan 10
exit

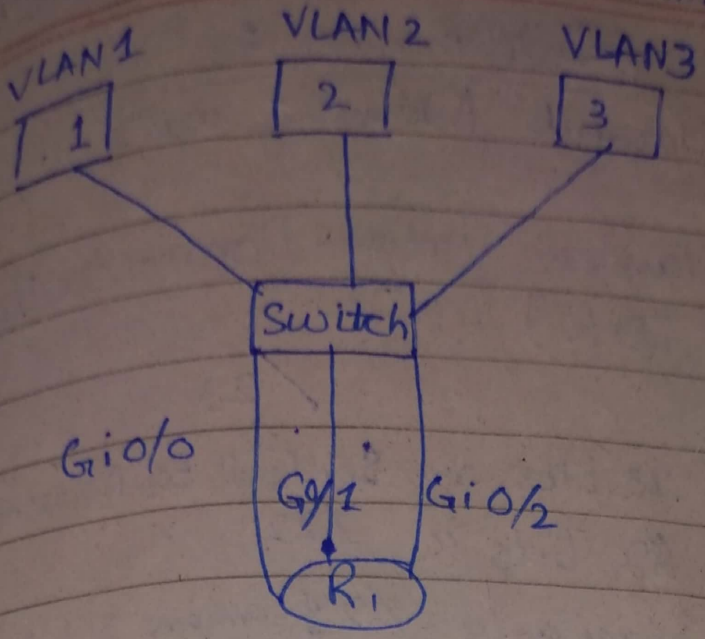
(3) S (config) # int fa 0/2
switchport access Vlan 20
exit

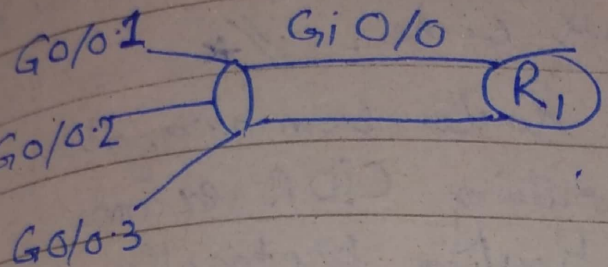
(4) S1 (config) # int fa 0/3
switchport mode trunk
exit

Router Configuration :

(5) R (config) # int fa 0/0.1
encapsulation dot 1q 10
ip address 10.0.0.1 255.0.0.0
exit

(6) R (config) # int fa 0/0.2
encapsulation dot 1q 20
ip address 20.0.0.1 255.0.0.0
exit





Show vlan to verify Newly created VLANs.
Show interface trunk

R (config) # int fa 0/0
no shutdown

S # Show int trunk

16 jan 2021

NTP

NETWORK TIME PROTOCOL

* NTP Synchronizes the time of a set of distributed time Servers & clients.
* NTP Synchronizes so you can correlate System logs & other time Specific events from multiple network devices.
* Stratum is used to NTP to describe the distance b/w a device & time source.
Stratum 1 = Time Source is directly attached.
Stratum 2 = Time is received from a Stratum Source. via NTP.

CODE :-

R1(Config)# int fo/0
ip address 1.0.0.1 255.0.0.0
no shutdown
exit.

S1 :- check Router clock before NTP configuration.
R1# Show clock.

S2 → Enable NTP servers on NTP Machine.

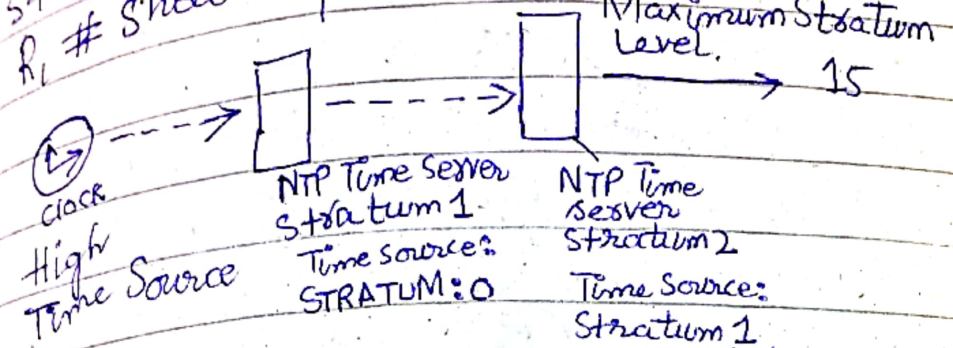
R1 (Config) # ntp server 1.0.0.200
exit.

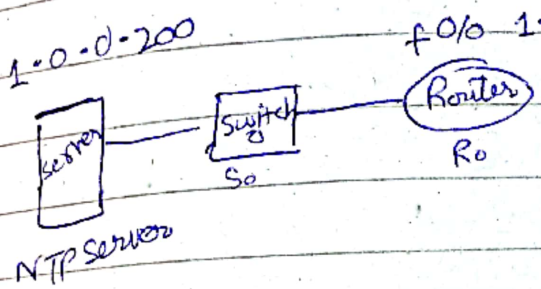
S3 → Check Date & Time after NTP.

R1 # Show clock.

S4 → Trouble shooting Command.

R1 # Show ntp status.



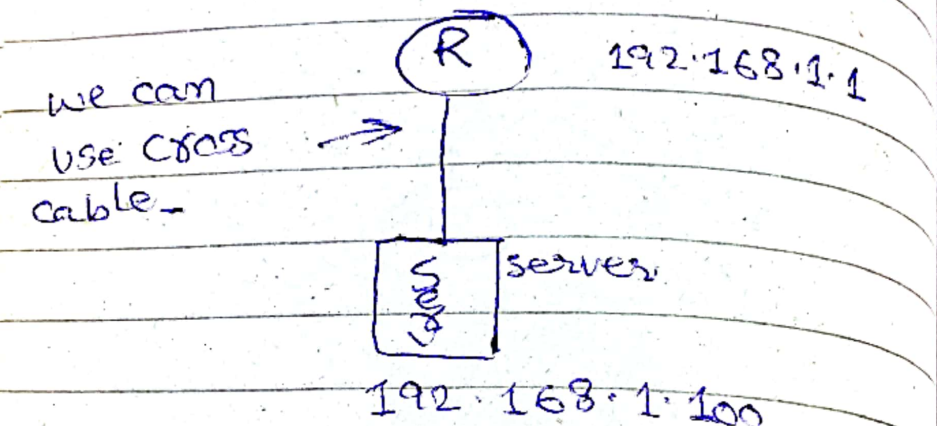


11-Jan-2021 SYSLOG

(13)

To know the status of any device we use SYS LOG server.

Any event which is occuring in device is called Log.
Admin use this Logs to find solution for troubleshooting device.



R(config) # int fa 0/0
R(config) # ip add 192.168.1.1
255.255.255.0
no shutdown.

R(Config)# logging host
192.168.1.100
R(Config)# logging trap
debugging

11-Jan-2024

Logging Trap (Severity Levels)

0 — 7

0 emergency
1 Alert
2 Critical
3 error
4 Warning
5 notification
6 informational
7 Debugging

↑ Less Severe

(Mostly Humare pass "5" ka log Severity ata hy).

SysLOG Messages:- Admin Dead these msgs to Know what type of error is found in the device.

1. Logging Buffer (RAM) inside a Router or Switch.
2. Console Line.
3. Terminal Line.
4. Syslog Server.

(Mostly Syslog Server per Syslog Msg aty hyn)

R# debug ip icmp
R# Ping 192.168.1.100

LAB ACL

?? Jan. 2021

Access CONTROL LIST (Used for Packet Filtering)

Standard Access List (1-99) → Place the Standard ACL near the destination.

Extended Access List (100-199) → Place the extended ACL near the source.

Distance Vector — RIP, EIGRP
Link State — OSPF
Path Vector — BGP

EIGRP works on Bandwidth + Delay
OSP " " Cost
RIP " " Hop Count

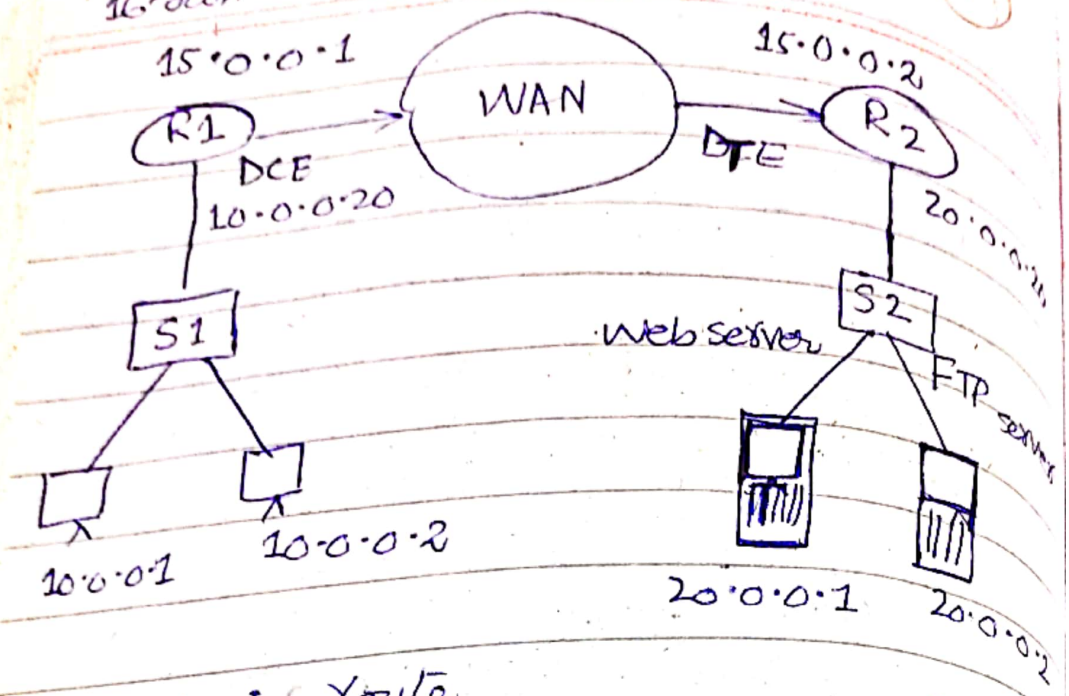
Standard Access List (Port Block to all users or services)

Extended Access List (Block Any Particular / service)

NOTE :-

R2 port. Near کے Destination پر Standard ACL
the Serial [illegible] apply کی Standard ACL [illegible] R1
Port of R_1 Because Server is destination Under R2,
Is tarha PC A Klye HTTP & FTP ki services
OFF hojaengi or PC B Klye Services on
rahengi.

16-Jan-2021



R1 #sh ip route
R1 (config) # router rip
network 10.0.0.0
network 15.0.0.0

R1 # sh ip route
R2 # sh ip route
R2 (config) # router rip
network 15.0.0.0
network 20.0.0.0

R2 # sh ip route

Now Goto Computer A → Web Browser write http://20.0.0.1 press [Go] This will show in URL the cisco Packet Trace web-page. Similarly 20.0.0.2 press [Go]. It will show Cisco PT page. Which means Both PC's are accessing HTTP & FTP Servers.

STANDARD ACL

R1(config)# access-list 10 deny host 10.0.0.1
access list 10 permit any.

(18)

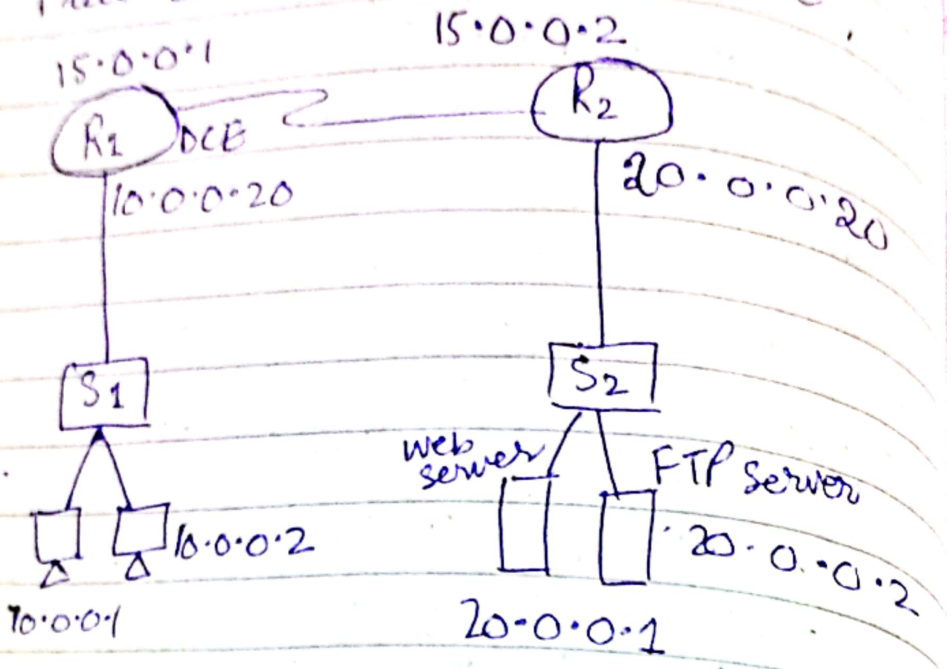
R1(config)# int s0/0/0
ip access-group 10 out.

LAB

23-JAN-2017

EXTENDED ACCESS-LIST (100-199)

Place Extended ACL near Source.



A access the Server

B access FTP Server

R1, R2 # Sh ip route

R1, R2 (config)# router rip

R1 (config)# router rip

network 10.0.0.0

network 15.0.0.0

R2 (config)# router rip

network 20.0.0.0

network 15.0.0.0

R1 (Config)# access-list 110 deny tcp host 20.0.0.1 eq www OR 80

R1 (Config)# access-list 110 deny tcp host 10.0.0.1 host 20.0.0.1 eq www or 80

R1(config)# access-list 110 deny tcp host 10.0.0.2 host 20.0.0.2 eq ftp or 21

R1(config)# access-list 110 permit ip any any

R1(config)# int fa 0/0
R1(config)# ip access-group 110 in